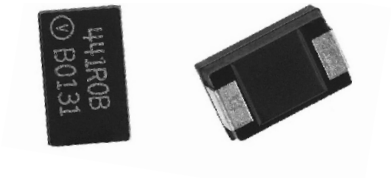
Ultra High Precision Z-Foil Molded Surface Mount Resistor with TCR down to ± 0.05 ppm/°C, PCR of ± 5 ppm at Rated Power, Flexible Terminations, and Load Life Stability of ± 0.005 % (50 ppm)



Any value at any tolerance available within resistance range

INTRODUCTION

The SMRxDZ is an ultra high precision molded surface mountable resistor offering all the elements of precision; including low TCR, tight tolerance, long term stability, low noise, low thermal EMF, and non-measurable voltage coefficient. One of the important parameters influencing stability is the Temperature Coefficient of Resistance (TCR). Although the TCR of foil resistors is considered extremely low, this characteristic has been further refined over the years. The SMRxDZ utilizes ultra high precision Bulk Metal® Z-Foil.

The Z-Foil technology provides a significant reduction of the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient).

Voltage division with tight tracking < 2 ppm/°C can be achieved with 2 **randomly** selected units even with a large ratio between the two values.

Our Application Engineering Department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - TOLERANCE AND TCR VERSUS RESISTANCE VALUE
(- 55 °C to + 125 °C, + 25 °C Ref.)

VALUE	STANDARD TOLERANCE[1)]	TYPICAL TCR AND MAX. SPREAD[1)] (ppm/°C)
50 Ω to 80 kΩ	± 0.01 %	± 0.2 ± 1.8
20 Ω to < 50 Ω	± 0.02 %	± 0.2 ± 2.8
10 Ω to < 20 Ω	± 0.05 %	± 0.2 ± 4.8
5 Ω to < 10 Ω	± 0.1 %	± 0.2 ± 6.8

Note

1. Tighter performances are available

FEATURES

- Temperature Coefficient of Resistance (TCR): ± 0.05 ppm/°C typical (0 °C to + 60 °C) ± 0.2 ppm°C typical (- 55 °C to + 125 °C, + 25 °C Ref.)
- Tolerance: to ± 0.01 %
- Power Coefficient of Resistance (PCR) "ΔR due to self heating": 5 ppm at Rated Power
- Flexible terminations ensure minimal stress transference from the PCB due to a difference in Thermal Coefficient of Expansions (TCE)
- Electrostatic Discharge (ESD) above 25 000 Volts
- Load Life Stability: ± 0.005 % (70 °C, 2000 hours at Rated Power)
- Resistance Range: 5 Ω to 80 kΩ (for higher and lower values, please contact us)
- Power Rating: to 600 mW at 70 °C
- Non Inductive, Non Capacitive Design
- Current Noise: - 40 dB
- Voltage Coefficient: < 0.1 ppm/V
- Non Inductive: < 0.08
- Non Hot Spot Design
- Terminal Finishes available: Lead (Pb)-free, Tin/Lead Alloy
- Matched sets with TCR tracking are available upon request
- For higher performances please contact us
- Any value available within resistance range (e.g. 1K234)
- Prototype samples available from 48 hours. For more information, please contact foil@vishay.com

Pb-free Available

RoHS* COMPLIANT

APPLICATIONS

- Precision amplifiers
- High precision instrumentation
- Medical
- Automatic test equipment (ATE)
- Industrial
- Audio (High end stereo equipment)
- EB application
- Military, airborne and space
- Pulse application
- Measurement instrumentation

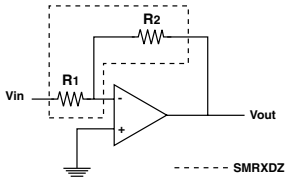
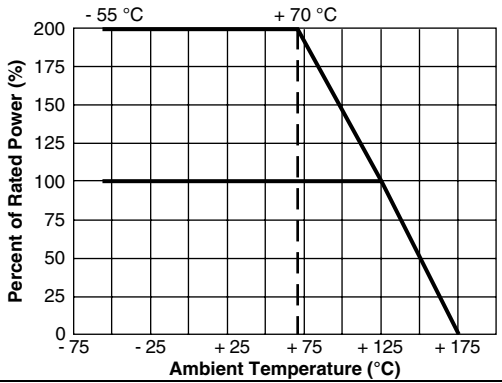


FIGURE 1 - POWER DERATING CURVE



* Pb containing terminations are not RoHS compliant, exemptions may apply

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TABLE 2 - PERFORMANCE SPECIFICATIONS

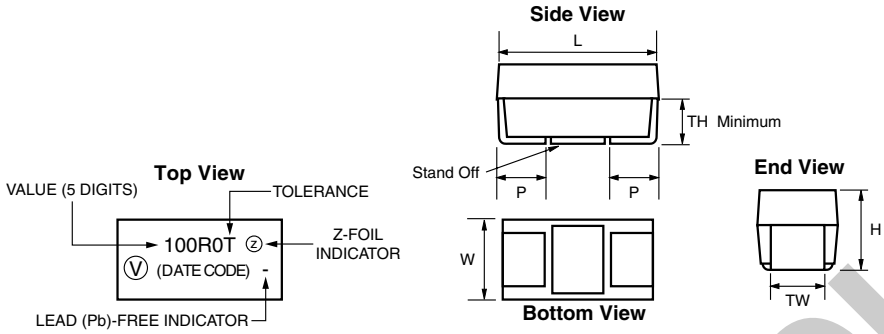
TEST	CONDITIONS				MAXIMUM LIMIT[1)]	
	SMR1DZ		SMR3DZ		SMR1DZ	SMR3DZ
Resistance Range					5 Ω to 33 kΩ	5 Ω to 80 kΩ
Rated Power	5 Ω to 10 kΩ 0.250 W at 70 °C 0.125 W at 125 °C	10 kΩ to 33 kΩ 0.160 W at 70 °C 0.08 W at 125 °C	5 Ω to 30 kΩ 0.6 W at 70 °C 0.3 W at 125 °C	30 kΩ to 80 kΩ 0.4 W at 70 °C 0.2 W at 125 °C	See figure 1	
Maximum Working Voltage					73 V	180 V
Maximum Operating Temperature	+ 175 °C (See figure 1)					
Working Temperature Range	- 55 °C to + 125 °C (MIL range)					
Thermal Shock	- 65 °C to + 175 °C; 30 minutes; 5 cycles				± 0.01 % (100 ppm)	
Short Time Overload	6.25 x Rated Power; 5 seconds				± 0.01 % (100 ppm)	
Low Temperature Operation	- 65 °C, 24 hours (no load): 45 minutes at Rated Power				± 0.01 % (100 ppm)	
Dielectric Withstanding Voltage	Atmospheric Pressure; AC 200 V; 1 minute				± 0.01 % (100 ppm)	
Insulation Resistance (MΩ)	DC 100 V; 1 minute				over 10 000	
Resistance to Soldering Heat (%)	260 °C; 10 seconds				± 0.02 %, ± 0.01 % typical	
Moisture Resistance	+ 65 °C to - 10 °C; 90 % to 98 % RH; Rated Power; 240 hours				± 0.02 % (200 ppm)	
Shock	100 G; Sawtooth				± 0.01 % (100 ppm)	
Vibration, High Frequency	10 ~ 2000 ~ 10 Hz; 20 G; X, Y, Z each 2.5 hours				± 0.01 % (100 ppm)	
Load Life Stability (2000 h)	0.04 W at + 70 °C 0.25 W at + 70 °C 0.125 W at + 125 °C		0.1 W at + 70 °C 0.6 W at + 70 °C 0.3 W at + 125 °C		Typical 0.005 % 0.02 % 0.02 %	Typical 0.005 % 0.015 % 0.015 %
High Temperature Exposure	175 °C; No Load 2000 hours				± 0.05 % (500 ppm)	
Weight					0.1143 g	0.244 g
Packaging	Bulk (loose) or Tape and Reel, per EIA-481-1					

Note

1. As shown + 0.01 Ω to allow for measurement error at low values

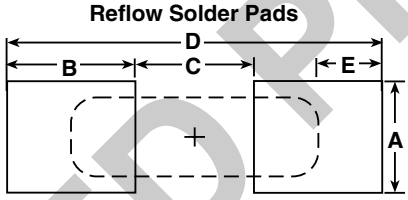
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FIGURE 2 - DIMENSIONS in inches (millimeters)



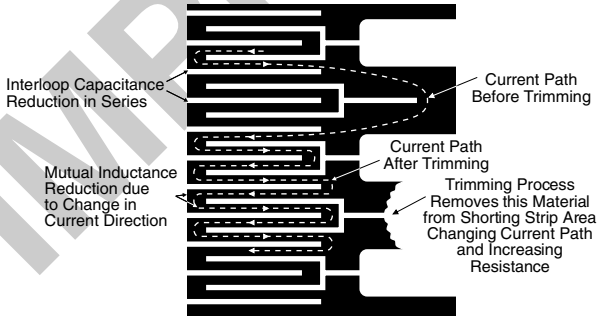
MODEL	L	W	H	P	TW	TH (minimum)
SMR1DZ	0.236 ± 0.012 (5.99 ± 0.30)	0.126 ± 0.012 (3.20 ± 0.30)	0.098 ± 0.012 (2.49 ± 0.30)	0.051 ± 0.012 (1.30 ± 0.30)	0.087 ± 0.004 (2.21 ± 0.10)	0.039 (0.99)
SMR3DZ	0.287 ± 0.012 (7.29 ± 0.30)	0.170 ± 0.012 (4.32 ± 0.30)	0.110 ± 0.012 (2.79 ± 0.30)	0.051 ± 0.012 (1.30 ± 0.30)	0.095 ± 0.004 (2.41 ± 0.10)	0.039 (0.99)

FIGURE 3 - RECOMMENDED MOUNTING PAD GEOMETRIES in inches (millimeters)



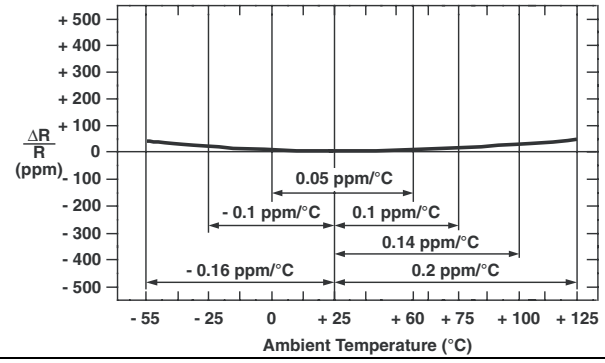
MODEL	METHOD	A MIN.	B REF	C REF	D ± 0.04 (± 1.02)	E REF
SMR1DZ	Reflow	0.110 (2.79)	0.106 (2.69)	0.124 (3.15)	0.337 (8.55)	0.050 (1.27)
SMR3DZ	Reflow	0.118 (3.00)	0.106 (2.69)	0.175 (4.45)	0.388 (9.86)	0.050 (1.27)
Per IPC-SM-782 Rev A						

FIGURE 4 - TRIMMING TO VALUES (Conceptual Illustration)



NOTE: Foil shown in black, etched spaces in white

FIGURE 5 - TYPICAL TCR CURVE Z-FOIL



Notes
- For more details, see table 1
- The TCR values for < 80 W are influenced by the termination composition and the result in deviation from this curve

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TABLE 3 - GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBER: Y174510K0000T9R (preferred part number format)

DENOTES PRECISION	VALUE	AER*
Y	**R** = Ω **K** = kΩ	**0** = Standard **9** = Lead (Pb)-free **1 - 999** = Custom

Y	1	7	4	5	1	0	K	0	0	0	0	T	9	R

PRODUCT CODE	RESISTANCE TOLERANCE	PACKAGING
1745 = SMR1DZ **1746** = SMR3DZ	**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**L** = Bulk Pack **R** = Tape and Reel

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1745 10K0000 T 9 R:

TYPE: SMR1DZ
VALUE: 10.0 kΩ
ABSOLUTE TOLERANCE: ± 0.01 %
TERMINATION: Lead (Pb)-free
PACKAGING: Tape and Reel

HISTORICAL PART NUMBER: SMR1DZ 10K000 TCR0.2 T S T (will continue to be used)

SMR1DZ	10K000	TCR0.2	T	S	T
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
SMR1DZ **SMR3DZ**	10.0 kΩ		**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**S** = Lead (Pb)-free **B** = Tin/Lead	**B** = Bulk Pack **T** = Tape and Reel

Note

* For non-standard requests, please contact Application Engineering.

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